THE FIRM LIFE CYCLE HYPOTHESIS AND CORPORATE PAYOUT RESPONSES TO THE 2003 TAX CUT

By

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ABSTRACT

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This dissertation examines changes in corporate dividend policies in response to the taxregime change resulting from the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA). It is shown that firms at different stages of the life cycle have significantly different responses in dividend policy to the change in dividend taxation, after controlling for profitability, investment opportunities, free cash flow, firm size, leverage, liquidity, and the rate of economic growth. Low- and moderate-payout firms responded to JGTRRA by increasing their payout ratios, while the highest-payout firms reduced their payout ratios after 2003. A significant portion of the increased propensity to pay dividends in the post-JGTRRA period can be explained by the increase in the propensity of growing companies to pay dividends as they mature. This result is consistent with the firm life-cycle hypothesis.

Copyright by LU TAN 2014 To my parents and to all who have stayed close to me through good and bad times.

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CHAPTER ONE

INTRODUCTION

The effects of dividend taxation on corporate behavior have been debated by scholars for decades. The debates do not appear to have achieved a consensus, due largely to the lack of compelling tax variations (Auerbach (2010)). The most recent cut in dividend and capital-gains tax rates provides an important opportunity to study the effect of taxes on dividends and corporate financial policy, and to draw empirical lessons of relevance for tax policy.

In 2003, the U.S. Congress reduced the tax rates on dividends and capital gains. This law is known as The Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA). The objective of this study is to provide insights into the determinants of firms' payout policies after the tax-policy change. Specifically, the first goal of the paper is to quantify the impact of JGTRRA on the propensity of firms to pay any dividends, as well as on dividend payout ratios. The second goal is to investigate the way in which the responses of corporate payout policies to JGTRRA vary for firms at different stages of the firm life cycle.

In the four decades before the passage of JGTRRA, there was a substantial decrease in the percentage of firms that pay any dividends. From 1963 to 1967, 71.6 percent of NYSE, AMEX, and NASDAQ non-financial non-utility firms paid dividends. This

proportion declined to 36.1 percent in 1983-87, and to only 20.8 percent in 1999 (DeAngelo, DeAngelo, and Skinner (2004)). Fama and French (2001) have referred to this as the phenomenon of "disappearing dividends". They attribute the reduction in the proportion of firms that pay dividends to the surge in the number of newly listed small firms that did not pay any dividends.

The trend of disappearing dividends reversed in the last decade. The proportion of firms paying dividends increased to an average of 30.5 percent from 2006 to 2010, although it remained far below the level of a few decades before. However, this occurred at the same time as a sharp reduction in the total number of publicly traded companies. The firms that exited the market had a disproportionate tendency to pay no dividends. Over 2000 firms exited the market from 2000-Q2 and 2005-Q2, only 2 percent of which were dividend payers. Thus even if the surviving companies did not increase their distributions at all, the average payout ratio would still be higher. Moreover, as the surviving companies grow older, their increasing financial stability may increase the probability that they would make distributions. As a result, in analyzing this change in dividend behavior, it is important to deal with issues of sample selection. Without taking into consideration the reduction in the total number of companies and their growth patterns, it is difficult to distinguish the net effect of JGTRRA from the selection of companies and time-driven life-cycle effects.

To account for these econometric issues, I add the choice of exiting the market into a model of corporate dividend policy, and estimate the relative probabilities among

alternatives with a multinomial logit model. Furthermore, I include an exogenous proxy for firm life-cycle stage that is preferable to those used in previous research designs. Specifically, I use the age of the firm to distinguish between young firms and mature firms, to identify the differences in their responses to a change in dividend taxation. Thus the estimated aggregate effect of a dividend tax change depends on the cross-sectional distribution of the age of firms.

My main findings are as follows. First, the marginal effect of the tax-policy change on the propensity to pay dividends is significantly different for firms at different stages of the life cycle. In the pre-JGTRRA period, mature firms were more likely to pay dividends than young firms. In the post-JGTRRA period, however, there was mean reversion in the probability of paying dividends. Young firms became more likely to pay dividends in the post-JGTRRA period than in the pre-JGTRRA period, while the probability of paying dividends declined for mature firms. Second, mature firms did not increase the proportion of their earnings paid out in dividends after JGTRRA. In fact, after controlling for payout history and profitability, the average payout ratio *decreased* for firms over the age of 42. Finally, the average payout ratio increased in the post-JGTRRA period. This is due to a large increase in payout ratios for moderate-dividend-payout firms, as well as the initiation of dividend payments by many firms that had never paid dividends before JGTRRA. These findings of tax-policy effects are important, but it is also true that dividends exhibit a great deal of stickiness. Many firms in the sample have not paid dividends during the whole sample period of 1993-2010, and thus these firms were not responsive to any

changes in dividend tax policy.

Overall, the dividend payout ratio increased among young firms in the post-JGTRRA period, while the propensity to pay dividends decreased among mature firms. These patterns are consistent with the theoretical predictions developed in Chapter Three. The remainder of this dissertation proceeds as follows. In Chapter Two, I review the relevant literature and summarize the main components of the 2003 Tax Act. In Chapter Three, I develop a theoretical prediction of the effect of JGTRRA. In Chapter Four, I describe the data and the variables used in the analysis. I discuss the empirical results in Chapter Five, and present additional sensitivity tests in Chapter Six. The dissertation concludes with Chapter Seven.

CHAPTER TWO

LITERATURE REVIEW AND THE JOBS AND GROWTH TAX RELIEF RECONCILIATION ACT OF 2003

A large body of theoretical work on dividend payments has been developed in the fields of public finance and corporate finance. In this chapter I will summarize the main theories of dividend taxation. These are agency models, signaling theory, and more recently, the firm life-cycle hypothesis.

2.1. Theories of Dividend Taxation

Historically, dividend income has most often been taxed at a higher rate than capital-gains income.¹ This tax penalty on dividend income for individual taxpayers leads to the question of why firms pay dividends. Economists have long been puzzled that firms pay dividends instead of repurchasing shares, and that firms issue new equity simultaneously with paying dividends. Several theories have been developed to explain the "Dividend Puzzle". Miller and Modigliani (1961) argue that a firm's dividend payout policy is irrelevant to its market valuation, but most of the empirical evidence suggests the opposite. For example, Sialm (2009) provides direct evidence that taxes are capitalized into asset prices. Dhaliwal, Krull, Li, and Moser (2005) show that the magnitude of the

¹ The only exceptions are the short period of 1988-1990 following the Tax Reform Act of 1986, and the years after 2003.

dividend tax capitalization is a function of the marginal investor's tax attributes.

Under the "traditional view" of dividend taxation, new shares are the marginal source of finance. See, for example, Harberger (1962) and Feldstein (1970). Under the traditional view, a reduction in the rate of dividend taxation would reduce the costs of dividends, stimulate corporate investment, and raise dividend payments. Poterba and Summers (1985) provide support for the traditional view, using data from the United Kingdom.

The "new view" of dividend taxation proceeds from the assumption that retained earnings are the marginal source of funds for investments. See Auerbach (1979), Bradford (1981), and King (1977). According to the new view, the benefits of dividend tax deferral effectively offset the future dividend tax liability attributable to the investment financed by retained earnings. Therefore, dividend taxes do not increase the tax burden on investments financed with retained earnings. See Auerbach (1979) and Zodrow (1991). Desai and Goolsbee (2004) find a statistically insignificant relationship between investment and dividend taxation, thus providing empirical evidence in support of the new view.

2.2. Agency Models and Signaling Theory

Lintner (1956) conducted a survey of managers, and found that they decided the future level of dividends based on the current level of dividends. Managers tended not to reduce dividends unless there were no other alternatives, and increased dividends only if the new dividend levels were sustainable. This empirical finding is known as dividend

smoothing, which is, at least in part, related to agency costs and signaling effects (Brav, *et al.* (2005)).

The "informational content of dividends" was first discussed by Miller and Modigliani (1961), when they relaxed the assumption of perfect information in their taxirrelevance theory. Within the context of signaling theory, the payment of dividends may provide information that is not revealed by financial statements, audit reports, or firm announcements. Thus the payment of dividends can serve as a signal of the financial health of the firm. See John and Williams (1985) and Bernheim and Wantz (1995). Within the context of dividend signaling theory, the major effect of the dividend tax rate on the market reaction to dividend distributions is to provide credible signals of profitability and effective corporate governance for firms that pay dividends. If we assume that dividend distribution involves some costs, and that these costs are higher for low-quality firms, then in the perfect Bayesian equilibrium high-quality firms are willing to pay higher dividends than low-quality firms. As a result, investors can reasonably regard dividend levels as a signal of profitability and effective corporate governance. Since the costs of funds are partly determined by the dividend taxes, it follows that, at a higher rate of dividend taxation, a high-quality firm can pay a lower level of dividend to deter imitation by a lowquality firm.

In the context of agency models, one major explanation for why firms pay dividends is the free-cash-flow hypothesis. See Jensen (1986) and Blanchard, Lopez-de-Silanes, and Shleifer (1994). This hypothesis is based primarily on the existence of a

conflict of interest between managers and shareholders. For example, managers may be tempted to invest free cash flows in pet projects with negative net present value. Thus dividend payments can serve as a method to discipline managers by reducing free cash flows.

Lang and Litzenberger (1989) find that the average announcement return of a large dividend change is significantly higher for firms with low Tobin's Q than for firms with high Tobin's Q. Empirically, a low Tobin's Q is associated with a lower level of investment opportunities. This implies that a firm with a low Tobin's Q may suffer from overinvestment. This is consistent with the free-cash-flow hypothesis, in that an increase in dividends by a firm with low Tobin's Q could be interpreted as a signal of management's intention to mitigate overinvestment problems, and could therefore receive a larger reaction from the market.

After comparing the effects of dividend taxation in the new view, signaling, and agency models, Gordon and Dietz (2008) conclude that the agency model is most likely to fit the empirical evidence. Chetty and Saez (2010) develop a theoretical agency model, and argue that cash-richness may be associated with a tendency to invest in pet projects. Their model suggests that firms in which managers put more weight on profit maximization (either by having a large proportion of equity incentives such as stock options, or because they are being monitored carefully by institutional shareholders) are more responsive in dividend payout following a dividend tax cut.

To reduce the agency problems in corporate governance, institutional investors,

such as public and private pension funds, mutual funds, are generally considered to be more influential monitors of corporate governance. The involvement of large institutional investors increased dramatically during the mid-1980s with the advent of public pension fund activism (*e.g.*, Gillan and Starks (2007)). Since the corporate scandals of 2001 and 2002, institutional investors have tended to become more active. It should also be noted that the institutional investors are not affected by dividend taxes because their dividend income is tax-exempt. Auerbach (1983) and Baker and Wurgler (2004) show in theoretical models of the tax-clientele hypothesis that wealth-maximizing strategies are different for firms with different shareholders, so it is important to know the stock ownership structure of the firms. Auerbach predicts that clientele sorting occurs with respect to dividend payout rates.

Scholz (1992) and Graham and Kumar (2006) show empirical evidence consistent with the tax-clientele hypothesis. For example, Scholz (1992) uses the 1983 Survey of Consumer Finances and finds that investors choose portfolios based on their tax rates. Graham and Kumar (2006) find that retail investors prefer non-dividend-paying firms, while institutional investors prefer dividend-paying firms. They also show that investors who experienced an increase in their tax rates as a result of the 1993 tax law change reduced high-dividend-yield stocks in their portfolios, and the difference in dividend holdings between taxable and tax-deferred accounts is consistent with tax-motivated preferences. Based on the tax-clientele theory, a firm whose shareholders are primarily institutional investors is less likely to be impacted by a dividend tax cut than a firm owned

by individuals.

2.3. The Firm Life-Cycle Hypothesis

The theories discussed above do not explicitly refer to the firm life cycle. However, each of these theories has implications for firms at different stages of the life cycle. Therefore, each of these theories can be understood partly in terms of the life-cycle hypothesis. In this section, we will move on to the studies that explicitly depend on the firm life cycle.

Grullon, Michaely, and Swaminathan (2002) propose the "maturity hypothesis", which states that a firm would tend to increase dividends as it moves from a growth stage to a mature stage. Companies with high growth opportunities have less free cash flow. Therefore, a high dividend level is not needed to control free cash flow for a rapidly growing young firm. On the other hand, mature firms may face a dearth of profitable projects in which to invest. As a result, mature firms tend to have high free cash flows. Thus mature firms tend to be able to make high dividend payments. Therefore, a firm's dividend policy appears to depend on its life-cycle stage. This is also known as the "lifecycle hypothesis" (DeAngelo, DeAngelo, and Stulz (2006)).

Sinn (1991) argues that it is optimal for the firm to retain its profits for an extended period of internal growth (which necessarily follows the issue of new shares), and not to pay dividends until the firm's growth rate slows down. He suggests a life-cycle model in which firms progress from the traditional view (which assumes that new equity issues are

the marginal source of funds for investments) to the new view (which assumes that retained earnings are the marginal source of funds for investments). The effective cost of capital declines through the firm's life cycle as retained earnings accrue. Sinn concludes that, in the presence of high dividend taxes, high dividend payments signal that firms are mature and face a low cost of capital, because investments can be financed with dividend reductions. On the other hand, low dividend taxes associated with low dividends signal a lack of funds. Sinn argues that dividend tax distortions apply primarily to the immature firms that retain most of their profits. Following Sinn's arguments, the payout responses to a reduction in dividend taxation should be greater among immature firms.

Korinek and Stiglitz (2009) incorporate different financing constraints at different stages of the firm's life cycle into Sinn's model. They also assume an absence of agency problems (*i.e.*, they assume that retained earnings are allocated optimally by the manager). Korinek and Stiglitz establish new results on the intertemporal tax-arbitrage opportunities for mature firms. The key insight of Korinek and Stiglitz is that temporary dividend tax changes allow mature firms to engage in intertemporal tax arbitrage, by shifting dividend payments from high-tax periods to low-tax periods.

According to the free-cash-flow hypothesis, there are notable differences in the patterns of resource allocation between firms at different stages of the life cycle. DeAngelo, DeAngelo, and Stulz (2006) show that dividends are concentrated among the largest and most profitable firms. This is consistent with the fact that free cash flows are accumulated disproportionately by mature firms. Young firms are typically trying to gain

market share in their rapidly evolving industries. As a result, they are expected to invest heavily in expenses such as research and development, advertising, and capital expenditures. If they go public, they are likely to continue to need external financing to sustain their high growth rates and large expenses. Since young firms are more likely to need new capital, they do not benefit from high levels of dividends as much as mature firms (Easterbrook (1984) and Jensen (1986)).

The empirical study of Ittner, Lambert and Larcker (2003) has also shown that, as a result of cash constraints, young firms use a significantly higher proportion of equity incentives. The agency model of Chetty and Saez (2010) suggests theoretically that firms with a higher proportion of equity incentives are expected to be more responsive to a dividend tax cut. Thus, this theoretical result of Chetty and Saez implies that young firms will be more responsive to a dividend tax cut.

Thus the firm life-cycle hypothesis is consistent with a substantial variety of theoretical literature. However, the effects of heterogeneity in firms' life-cycle stages has not been tested in the prior empirical literature related to the 2003 Tax Act. In this dissertation, I show that when firm age is taken into account, dividend taxation has first-order effects on firm-level dividend payout. These effects are different for firms at different stages of the firm life cycle. When I include a quadratic in firm age, the estimated coefficients are such that young firms increase dividends. However, for firms that are sufficiently old, dividends decrease.

2.4. The Jobs and Growth Tax Relief Reconciliation Act of 2003

The effects of dividend taxation on corporate behavior have been debated by scholars for decades. See the survey in Hanlon and Heitzman (2010). The debates do not appear to have achieved a consensus, due largely to the lack of compelling tax variations (Auerbach (2010)). The most recent cut in dividend and capital-gains tax rates provides an important opportunity to study the effect of taxes on dividends and corporate financial policy, and to draw empirical lessons of relevance for tax policy.

The passage of JGTRRA in 2003 equalized the tax rates for capital gains and dividends for the first time since 1990. The new tax law decreased the top dividend tax rate from 38.6 percent in 2002 to 15 percent, and from 10 percent to 5 percent for lower-income individuals. The top capital-gains tax rate was reduced from 20 percent to 15 percent. For lower-income individuals, the capital-gains tax rate was reduced from 10 percent to 5 percent (and to zero percent in 2008).²

Several researchers have already studied the effects of JGTRRA. This research has found that JGTRRA had a significant and positive impact on dividend payments by U.S. firms. For example, see Julio and Ikenberrey (2004); Chetty and Saez (2005); Brown, Liang, and Weisbenner (2007); and Blouin, Raedy, and Shackelford (2011). Yet the precise explanation of the positive effect remains in dispute. Julio and Ikenberrey (2004) use a constant-size sample of 1,000 firms, selected on the basis of market capitalization. They find that dividend distributions began to increase starting in the late 1990s. Because

² These provisions of JGTRRA were scheduled to expire after 2010. However, in December 2010, the reduced tax rates were extended to 2012 by the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010.

the trend began prior to 2003, Julio and Ikenberrey conclude that the increase in dividend distributions could not be attributed entirely to the 2003 tax cut. Chetty and Saez (2006) also use a constant-size sample—including the top 3785 firms by market capitalization in each quarter, up to the second quarter of 2005. However, Chetty and Saez find that the trend of "disappearing dividends" stops precisely at the last quarter of 2002. Therefore, they argue that the 2003 tax cut had a clear, strong causal effect. Chetty and Saez also conclude that without a direct measure of the entry and exit effects, it is difficult to make precise inferences about the effects of the 2003 tax cut on the level and concentration of corporate distributions.

Brown, Liang, and Weisbenner (2007) test the effects of executive stock ownership on firm payouts, and find that executives with higher stock ownership are more likely to increase dividends after the 2003 tax cut, while no relation is found before the tax cut. They also find no difference in the dividends paid on stocks held by tax-exempt institutions before and after the tax cut. Blouin, Raedy, and Shackelford (2011) focus on the managerial stock ownership, as well as individual stock ownership. They use simultaneous equations to estimate both investor and managerial responses to the 2003 tax cut, and find that firms adjust their payout distribution in a manner consistent with the altered tax incentives for individual investors.

CHAPTER THREE

THEORETICAL PREDICTIONS

I will first develop a simple theory of separating equilibrium, to describe the payout behavior of young and mature firms in the presence of dividend taxation. This model generates testable hypotheses regarding the effect of JGTRRA on the dividend payout behavior of young firms and mature firms. The theory is based on the separating equilibrium in Bernheim and Wantz (1995). They show that the impact of dividend payout on the market value of the firm increases monotonically with the marginal cost of dividends, which is partly determined by the dividend tax rate, as shown in the market valuation function below,

$$v(y) = [\lambda \tau + (1 - \lambda)(\tau + \xi)^{1/2}]y.$$
(1)

where v is the market valuation, y is the dividend, τ is the dividend tax rate, λ is a number between 0 and 1, and ξ is a positive constant.

In the separating equilibrium, bad firms will pay no dividends, and investors will correctly identify non-dividend-paying firms as bad firms. This is illustrated in Figure 1(a). Assume that dividends are costly and that a typical manager cares about his firm's actual value (which is negatively related to dividends), as well as its perceived value by investors. The fundamental reason that dividends can serve as a signal here is that the marginal cost of dividends is higher for bad firms than good firms. Under these assumptions, we can depict managers' indifference curves on the y - v surface. In a separating equilibrium, bad firms will pay no dividends and be perceived with a market value of \underline{v} (which denotes the value of a bad firm paying no dividends under perfect information), and good firms will pay a dividend of \overline{y} and be perceived with a market value of \overline{v} (which denotes the value of a good firm that pays dividends of \overline{y} under perfect information). The choice of $(0, \underline{v})$ is the optimal choice for bad firms because in the separating equilibrium, the indifference curve of bad firms will be at the highest possible level among all other choices.

Since the choices of good firms and bad firms can be both included in the indifference curve of a bad firm, only the indifference of a bad firm will be kept for the further analysis (see Figure 1(b)).

In Figure 1(c), I use the signaling theory to set up the hypotheses for firms' payout responses after a dividend tax cut. The dividend payout and perceived firm valuation are denoted by y and v respectively. The figure depicts the indifference curve of a bad firm at the growing and mature stages. In the most efficient separating equilibrium of mature firms, a good firm will pay the level of dividends at \overline{y} , and investors will identify firms paying \overline{y} as good firms and value them at \overline{v} . On the other hand, bad firms pay no dividends, and they are valued at \underline{v} by investors.

The cost of paying dividends (or the "bang for the buck" in Bernheim and Wantz (1995)) is shown in the brackets of the market valuation equation shown above. As the

dividend tax increases, the cost of paying dividends increases, and good firms do not have to pay as large dividends in order to deter imitation of bad firms. This is illustrated as the flatter indifferent curves of the growing and mature firms, and higher payout to maintain the same perceived firm values in a separating equilibrium.

While it appears that the signaling theory suggests that firms will increase payout after the dividend tax reduction, there are a number of complications to this proposition. For example, the signaling theory does not account for firm heterogeneity. Since firms have different sources of funds and different compositions of the sources, their marginal costs of funds may have different correlations with the dividend tax rate. Because of these complications, most papers examining the effects of 2003 tax cut have been empirical. The majority of the studies use indirect tests, which try to infer the characteristics of firms making marginal dividend payments. In this paper, I develop the theoretical hypotheses after taking into consideration the effect of firm heterogeneity on the cost of dividends. According to the life-cycle hypothesis, dividends are more costly for growing firms, for a variety of reasons. These include the higher opportunity cost of investment opportunities,³ financing costs,⁴ and dividend tax distortions. The separating equilibrium for growing firms can be shown by the steeper indifference curve in Figure 1(c). The efficient

³ Grullon, Michaely, and Swaminathan (2002) argue that firms increase dividend payout as they grow older because the marginal return of capital declines.

⁴ Opler, *et al.* (1999), and Bates, Kahle, and Stulz (2009) provide evidence that when agency costs or asymmetric information make it more difficult to raise external capital, the precautionary incentive to conserve cash is increased.

separating outcome for the good growing firm will be at the point of $(\overline{y}', \overline{v}')$.

As a result of the dividend tax cut, the marginal costs of paying dividends are reduced, and each good firm is expected to increase its dividend payout. In Figure 1(a), the decrease in the marginal costs of paying dividends is demonstrated by a reduction in the slopes of the dotted indifference curves.

Moreover, in the life-cycle hypothesis, young firms have a higher proportion of funds from new issues of equity than retained earnings, and the firms relying on the new issues of equity are considered to bear heavier dividend taxes. The extrapolation of the life-cycle hypothesis predicts that the payout responses to a reduction in dividend taxation should be greater among growing firms. Under this hypothesis, growing firms face greater dividend tax distortions than mature firms in the pre-JGTRRA period, and thus the payout responses to a reduction in dividend taxation in the post-JGTRRA period should be greater among growing firms. In other words, the payout responses to a reduction in dividend taxation should be greater among growing firms, since the dividend tax distortion is reduced by a larger magnitude for growing firms than for mature firms.

Figure 1(d) is derived from Figure 1(c). If we draw the indifference curve for firms at each age and find the efficient separating dividend payout in Figure 1(c), we can connect the points on the firm-age/dividend-payout plane and get the curve S. The signaling theory predicts higher dividend payments after the dividend tax cut (as shown by the curve S').

In addition, for mature firms that are sufficiently old, when the ability to generate cash flows slows down and the agency costs are very high because of the separation of

ownership and control, the dividend payout might decline. In this case, the separating equilibrium curve would rotate from S' to S". Compared to mature firms, growing firms are more responsive in dividend payout to a reduction in dividend taxation, since they face greater reduction in dividend tax distortions than mature firms in the post-JGTRRA period. The prediction to be tested would be an increase in dividend payout from growing firms, and a decrease in dividend payout from mature firms.

In the following chapters, I will examine both the changes in the probability of paying any dividends and the changes in dividend payout ratios.⁵ The results are consistent with the predictions: In response to JGTRRA, growing firms increased both the propensity to pay dividends and the average payout ratios. On the other hand, after controlling for profitability and payout history, the 2003 tax cut is associated with a decrease in the likelihood that mature firms pay any dividends, and the high-dividend-paying firms reduced average payout ratios in the post-JGTRRA period. Although I did not have a direct measure of the tax characteristics of firms' shareholders, it should be noted that firms whose shareholders are primarily institutional investors are less likely to be impacted by a dividend tax cut than firms owned by individuals. Thus with a large and growing proportion of institutional investors, such as public and private pension funds, and growing charitable foundations, and tax-deferred individual accounts such as IRAs, the impact of the 2003 tax cut on dividend payout will be expected to have a smaller

⁵ The dividend payout ratio is defined as the percentage of a company's earnings that is paid in dividends. Details can be found in Chapter Four.

magnitude.

CHAPTER FOUR

DATA AND VARIABLES

The data for firm characteristics are taken from the CRSP/COMPUSTAT merged database. This database merges historical price and distribution data from the Center for Research in Security Prices (CRSP) and a variety of other company financial data from Standard and Poor's COMPUSTAT database. The sample includes all firms in fiscal year *t* that have values for total assets of at least USD 0.5 million, total sales of at least USD 20 million, and book equity of at least USD 0.25 million. Utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999) are excluded since they are subject to special regulations.

Figure 2(a) shows the aggregate number of firms in the sample and the number of firms paying dividends in each year from 1978 to 2010. The percentage of dividend initiators (*i.e.*, the firms that began paying dividends for the first time) gradually declined during the 1980s and 1990s. Figure 2(b) shows that the percentage of dividend initiators increased dramatically in 2003, consistent with the findings of Chetty and Saez (2006).

Moreover, over 2000 firms exited the market from 2000-Q2 and 2005-Q2. Only 2 percent of the exiting firms were dividend payers. Since most of the firms that exited the market were young firms that had never paid dividends, excluding the option of exiting the market could overestimate the effect of the tax-law change on firms' propensity to pay dividends.

Both dividend payout ratios and dividend yield ratios are used as measures of corporate dividend behavior. The dividend payout ratio is calculated as cash dividends (COMPUSTAT DATA 26) divided by earnings before interest and taxes. The dividend yield ratio shows the amount of dividends that a company pays to its investors in comparison to the market price of its stock, computed as the ratio of dividends per share to the share price at the end of the year.

DeAngelo, DeAngelo, and Stulz (2006) proxy for firm maturity by using retained earnings as a proportion of total equity. This measure is potentially endogenous. Instead, I use the direct and exogenous measure of firm age, computed as the difference between year t and the first year in which the firm appeared on CRSP/COMPUSTAT, plus one (firm age = $t - t_0 + 1$). Moreover, to control for the heterogeneity in the length of the firm life cycle across industry, I use a dummy variable equal to one if the firm's age is greater than or equal to the median age of the firms in its 3-digit SIC industry.

The earliest year in which a firm appeared on CRSP/COMPUSTAT is $1962.^{6}$ Thus the maximum age is 17 years at the end of 1978, and 49 years at the end of 2010. Figure 2(c) shows that the median firm age decreased in the 1990s during the Internet boom, and increased rapidly after the climax of the Internet bubble in 2000.

On average, firms are older after JGTRRA than before JGTRRA. The average age increased from 11.77 years in the pre-JGTRRA period (1993 – 2002) to 15.88 years in the

⁶ This measurement truncates at 1962. Fortunately, among the 909 firms, only 58 were founded before 1962.

post-JGTRRA period (2003 – 2010). (See Table 2.) An alternative measure of firm age the listing age—is the number of years between the current year and the date of the firm's initial public offering, plus one. The median listing age is less than the median firm age, but it follows a similar pattern of decreasing in the 1980s and 1990s, and increasing in the 2000s.⁷ (See Figure 2(d).)

Following the previous literature, I control for firm characteristics by using profitability (measured by the return on assets), a measure of the size of assets, Tobin's Q (measured by the ratio of market value to book value), a measure of leverage, cash holdings (as a measure of free cash flow), and a measure of liquidity. I also control for an important industry characteristic by using the median age of the firms in the industry, where the industry is defined as the three-digit SIC. All control variables are lagged by one year to reduce the possibility of endogeneity in estimation. The next few paragraphs contain detailed descriptions of each of the explanatory variables. These definitions are also summarized in Table 1. Descriptive statistics are summarized in Table 2.

Return on Assets: Return on Assets is a measure of firm profitability, computed as the ratio of the firm's operating income before depreciation (DATA13), divided by the book value of assets (DATA6). The average firm profitability was slightly lower after JGTRRA than before JGTRRA.

Tobin's Q: Tobin's Q (or the ratio of market value to book value) is included as a

⁷ The decrease in the median listing age in the 1980s and 1990s is due to the concentration of new listings in the time periods of 1986-1987 and 1995-2000.

proxy for investment opportunities. Tobin's Q is calculated as the market value of the firm's assets at the end of the year, divided by their book value (DATA6). The market value of assets is calculated as the book value of assets (DATA6), minus the book value of common equity (DATA60), plus the market value of common equity (DATA60), plus the market value of common equity (DATA25 x DATA199). In the post-JGTRRA period, the average level of Tobin's Q was lower than in the pre-JGTRRA period.

If the agency-costs/free-cash-flow hypothesis is correct, firms with greater investment opportunities will be less likely to pay dividends, because firms with greater investment opportunities will have fewer free cash flows.

Free Cash Flow: Dividend payments depend on the availability of a firm's cash flow. Following Lehn and Poulsen (1989), the firm's free cash flow is calculated by adding net income, depreciation, and deferred taxes,⁸ and then subtracting dividends paid⁹ and capital expenditures (computed as DATA13 - DATA15 - (DATA16 - DATA35) - DATA19 - DATA21). This measure of free cash flow is then divided by the market value of the firm's assets.

The free cash flows of the median firm are similar in the pre- and post-JGTRRA periods. However, the distribution of free cash flows is more positively skewed in the post-JGTRRA period, which means that the average free cash flow rose after JGTRRA.

⁸ Depreciation and deferred taxes are deducted in calculating net income (for tax purposes), although they do not directly affect cash flows.

⁹ Free cash flow is net of dividends because it is used to predict the dividends for the following year.

Liquidity: Liquidity, like Free Cash Flow, is a measure of the corporate financial resources that could potentially be the source of dividend payments. The difference is that liquidity is a broader measure than Free Cash Flow. Liquidity is calculated as the firm's cash and short-term assets (DATA1), divided by the market value of assets. The average level of liquidity was higher in the post-JGTRRA period than before JGTRRA. Although including the correlated variables of investment opportunities, free cash flow, and liquidity may reduce the statistical significance of the estimated coefficients, it will reduce the bias problem caused by omitting potentially important predictor variables.

Leverage: Leverage is measured by the ratio of total liabilities (DATA181) to the market value of assets (as defined above). Bagwell and Shoven (1989) predict that firms with high indebtedness are less likely to make corporate distributions, all else equal. On average, the level of leverage was lower in the post-JGTRRA period than before JGTRRA.¹⁰

Industry age: Industry age is measured by the listing age of the median firm in the 3-digit SIC industry in year *t*. The average industry age increased from an average of 9.39 years before JGTRRA to an average of 13.60 years in the post-JGTRRA period.

Firm Size: In the agency model, larger firms have higher agency costs and lower financing costs, and are thus more likely to pay dividends. Firm Size is calculated as the natural logarithm of the ratio of the firm's market capitalization (DATA25 x DATA199) to

¹⁰ JGTRRA increased the relative cost of debt to equity by reducing the tax rates on dividends and capital gains. For a discussion of the relationship between the debt-equity choice and tax costs, see Auerbach (1979).

the equal-weighted average market capitalization of all firms in year *t*. The average size of firms increased after JGTRRA.

GDP Growth Rate: The final explanatory variable is the annual growth rate of real GDP, from the U.S. Bureau of Economic Analysis. According to the agency models, a firm may increase its dividend payments to control excessive spending, either because there is an increase in cash flow (which is good news for the firm), or because of a decrease in investment opportunities (which is bad news for the firm). The nature of the information revealed about the firm may vary depending on conditions in the aggregate economy.

The summary statistics shown in Table 2 indicate that in the post-JGTRRA period, which experienced a lower rate of economic growth, the average firm had fewer investment opportunities (lower average Tobin's Q), accumulated more cash flows, raised less debt (lower leverage), and had more liquidity.

CHAPTER FIVE

EMPIRICAL EVIDENCE

5.1. The Time-Series Behavior of Corporate Distributions

Two samples will be used in this chapter. The unrestricted sample includes all firms that have values for total assets of at least USD 0.5 million, total sales of at least USD 20 million, and book equity of at least USD 0.25 million, and excludes the Utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999) that are subject to special regulations. The summary statistics were described in Chapter Four. The restricted sample consists of a balanced dataset that includes all the firms that maintained their corporate identities for the entire 18-year period from 1993 to 2010, and for which we have information on dividends and earnings before interest and taxes.

The restricted sample includes 909 firms, so that the sample has (909 firms) * (18 years) = 16,362 firm-year observations. Among these firms, 289 firms paid dividends every year, while 389 firms did not pay dividends in any year. Figure 3 presents evidence on the persistence of dividend payments, consistent with the literature. The majority of the firms either keep paying dividends every year or never pay dividends in any year. Lintner (1956) cites the managers' belief that the market places a premium on dividend stability or gradual growth. The existence of dividend stability is empirically supported by several authors. For example, Fama and Babiak (1968) find that dividend payouts are unchanged for 25% of their sample between 1947 and 1965, while 33% of Pettit's (1972) sample of

634 firms had constant dividends for 18 quarters. More recently, Leary and Michaely (2011) find that firms smoothed dividends more in the 1990s and in the 2000s than they did in the 1960s and 1970s.

I test two kinds of corporate payout behaviors: (1) dividend-paying vs. nondividend-paying vs. exit, (2) the payout ratio (*i.e.*, the ratio of dividends to net earnings). The unrestricted/unbalanced sample will be used in the rest of Section 5.1 for descriptive analysis and then used after Section 5.5 to test the first behavior. The restricted sample will be used in Sections 5.2 to 5.5 to measure the second behavior. Since 389 firms never paid dividends, the variation in payout ratios comes exclusively from the 289 dividendpaying firms and the 231 firms that paid dividends in some years, but not in others.¹¹ The descriptive details of payout ratios will be discussed in Section 5.2.

Figure 4(a) plots the time-series behavior of dividends per share, earnings per share, and the payout ratios for the firms in the unrestricted sample. On average, dividends per share decreased from \$0.36 in 1993 to \$0.24 in 2002. This trend reversed after 2002, and the level of dividends per share has increased steadily since then. In 2010, the mean level of dividends per share reached \$0.44.¹² Earnings per share are more volatile than dividends per share. Earnings per share dropped substantially in 2001 and 2002, and again

¹¹ Among the 231 firms, only 6 firms initiated dividends in 2003 and made payments every year afterwards.

¹² These figures are nominal numbers without adjustment for inflation. Thus the decrease in real dividends before 2002 is more pronounced than these figures would suggest, while the increase in real dividends after 2002 is less pronounced.
in 2008 and 2009. Despite the fluctuations in corporate earnings, dividends per share remained relatively stable. Thus dividend payout exhibits a substantial degree of stickiness.

The plot of aggregate data in Figure 4(a) shows that the payout ratios remained within the range between 0.078 and 0.108 until 2003. The firms in the sample increased their payout after JGTRRA, on average. In the next section, a matched-pairs *t*-test will be performed to test the statistical significance of this observation.

5.2. Comparison Tests of Dividend Payout Ratios

The results of tests for the differences between the dividend payout ratios before and after 2003 are presented in Table 3. The pre-JGTRRA period includes 10 years from 1993 to 2002, while the post-JGTRRA period includes 8 years from 2003 to 2010. For each firm, the pre- and post-JGTRRA dividend payout ratios are calculated as the average of the annual payout ratios in the respective period. Consistent with the prediction that a reduction in the relative tax costs of dividends reduces the aversion of average investors toward dividends, 36 percent of the firms in the sample increased their dividend payout ratios following JGTRRA. The average dividend payout ratio rose from 8.9 percent before JGTRRA to 11.8 percent after JGTRRA. The one-tailed *t*-test shows that the differences between the payout ratios pre- and post-JGTRRA are statistically significant from the null hypothesis of zero at the five-percent level.

To look further into the dividend behaviors of different groups of firms, the

restricted sample is divided into five quintiles, based on their average payout ratios in the pre-JGTRRA period. (Quintile 1 has the lowest pre-JGTRRA average payout ratio.) The results reveal significant differences among the quintiles. Each of the first four quintiles experienced an increase in its average payout ratio after JGTRRA (from 0, 0, 0.006, and 0.115 before JGTRRA to 0.038, 0.033,¹³ 0.050, and 0.164 in the post-JGTRRA period). On the other hand, the average payout ratio of the firms in the highest quintile declined from 0.324 to 0.307. The mean differences are statistically significant for all quintiles.

The time path for each quintile is shown in Figure 4(b). The average payout ratio for quintile 5 declined after the peak in 2001 as the firms grew older, despite the short-term rise in 2008 and 2009.¹⁴ Quintile 4 has moderate average dividend payout ratios before JGTRRA, but shows the largest increase in average payout ratios after JGTRRA. (See Table 3.) Quintiles 1, 2, and 3 follow a similar pattern: These quintiles consist primarily or exclusively of non-dividend payers in the pre-JGTRRA period, while having positive average payout ratios after JGTRRA. Specifically, 22, 20, and 30 percent of the firms within Quintiles 1, 2, and 3 increased their average payout ratios. Some 78 percent of the firms in the first quintile and 80 percent of the firms in the second quintile continued to pay no dividends. In the two higher quintiles, 62 and 48 percent of the firms increased their

¹³ Since the first and second quintiles are composed of firms that did not pay dividends before JGTRRA and the rank among non-dividend payers is random, any differences between these two quintiles should be considered as random.

¹⁴ Dividend smoothers would be expected to have an increase in the payout ratio in those two years, because of the economic recession. If profits are down, and if dividends stay the same, the payout ratio will increase.

average payout ratios, respectively.

The fourth quintile has the largest number of firms with an increase in their dividend payout ratios (62 percent), as well as the highest average increase in payout ratios (an increase of 4.9 percentage points). In the third quintile, only 30 percent of the firms increased their payout ratios, while 14 percent of the firms reduced their payout. The average increase in payout ratios is 4.4 percentage points, which is nearly as large as the average increase in the fourth quintile. Thus the third quintile is characterized by relatively large increases in dividend payout ratios for a relatively small number of firms. The fifth quintile has the highest aggregate dividend payout, both before and after JGTRRA. Although 48 percent of the firms in the fifth quintile increased their dividend payout ratios after JGTRRA, the overall average dividend payout ratio was lower, because 51 percent of these high-dividend-payout firms reduced their dividend payout ratios during the period, and the reductions by the 51 percent were slightly larger than the increases by the 48 percent.

In the discussion that follows, I distinguish between "mature" firms, which are older than the median firm in their 3-digit industry, and "young" firms, which are younger than the industry median. The low- and medium-dividend-payout quintiles (Quintiles 1, 2, and 3) are mostly composed of young firms. (Young firms make up from 51 percent to 57 percent of the firms in these quintiles.) On the other hand, 73 percent of the firms in Quintile 4 are mature, along with 79 percent of the firms in Quintile 5. The quintile-specific evidence is consistent with the prediction that mature firms are able and willing to

pay more dividends when facing high tax burdens (a top marginal tax rate of 38.6 percent before JGTRRA) to signal maturity. The separate plots of dividend payout ratios for young and mature firms in Figure 4(c) manifest a gap between the dividend payout ratios for young firms and mature firms, although the gap narrowed in the post-JGTRRA period. This reduction was the result of the increase in average dividend payout ratios of the lowand moderate-dividend-payout young firms, along with the reduction in average payout ratios of the highest-dividend-payout mature firms.

A similar comparison is made on the differences of yield ratios between young and mature firms (Figure 4(d)). Yield ratios are calculated as the ratio of dividends to share prices. The average yield ratio of mature firms moved downward slightly in the pre-JGTRRA period, and increased after JGTRRA. Thus the graph indicates that mature firms provide a higher rate of return in dividends, relative to investors' costs, than young firms. The spike of yield ratios in 2008, and the fact that in 2009 the ratios don't fall back to their pre-2008 levels, are a result of both dividend-smoothing and the plunge in stock prices during the financial crisis.

5.3. Effects of JGTRRA

To test the significance of the effects of JGTRRA on dividend payout ratios, I modify Lintner's (1956) model and include a firm-specific error term to control for unobserved firm-level heterogeneity.

$$Payout_{it} = \beta_0 + \beta_1 Payout_{i,t-1} + (\beta_2 + \delta Post_t) * ROA_{i,t-1} + \varepsilon_i + u_{it}, \qquad (2)$$

where $Payout_{it}$ and $Payout_{i,t-1}$ are the current and lagged payout ratios; $Post_t=1$ if t > 2002, and zero otherwise, and *ROA* is return on assets. In equation (2), β_1 measures the stickiness of dividend payout ratios. It is expected to be positive because of the otherwise adverse signaling effects of dividend cuts. The effects of JGTRRA on dividend payout ratios are measured by δ . A positive (negative) estimate of δ would provide evidence that payout ratios were raised (lowered) in the post-JGTRRA period. The results of ordinary least squares regressions, controlling for firm fixed effects, are listed in column (1) of Table 4. All standard errors have been corrected for firm clustering.

The coefficient of the lagged dividend payout ratio, β_1 , is positive and statistically significant at the one-percent level. This is consistent with the theoretical predictions, as well as Lintner's finding of persistence in dividend payments and the well-documented observation of dividend smoothing. The coefficient of the interaction term between profitability and the post-JGTRRA period, δ , is positive and statistically significant at the five-percent level. This indicates that the average payout ratios increased substantially in the post-JGTRRA period.

As expected, the relation between profitability $(ROA_{i,i-1})$ and the payout ratio, β_2 , is significantly negative. This suggests that an increase in dividends is associated with a declining return on assets. This is consistent with the stickiness of dividend payments since, as profits drop, the payout ratios will increase if dividends payments remain constant. This is also consistent with the prediction of the life-cycle hypothesis that a firm

would tend to increase dividends as it moves from a growth stage to a mature stage, as mature firms face fewer investment opportunities and have more free cash flow. For example, DeAngelo, DeAngelo, and Skinner (1994) find that more than two-thirds of the 145 NYSE firms in their sample responded to stalled earnings growth by increasing dividends.

In addition, the sum of β_2 and δ is positive, which indicates that profitability has a net positive effect on corporate dividend payout *after* JGTRRA. This result holds after controlling for firm maturity, and also for regressions within all of the subgroups of firms that are discussed in the following sections.

It should be noted that since the lagged dependent variable is used in the regression, it may cause bias in the estimates as the error term is correlated with the lagged dependent variable. This bias may be mitigated with the relatively large sample size used in the regression. An alternative estimation strategy, involving differencing and instrumental variables, would be a fruitful avenue for further research.

5.4. An Inverse-U-Shaped Relationship between Payout Ratios and Firm Age

Since firms tend to pay more dividends as they grow older¹⁵, the estimate of the effect of JGTRRA on dividend payout ratios could be overstated. As shown in Figure 2(c), the median firm age increased monotonically from 1996 to 2010. Thus the estimate of δ

¹⁵ A discussion of interpreting the results as an age effect or a vintage effect can be found in Section 5.5.

(the parameter for the effect of JGTRRA) could also be capturing the effect of firm age on dividend payout ratios. To control for the effect of firm age on dividend payout ratios, I include a quadratic in the age of the firm, with firm age and its squared form

$$Payout_{ii} = \beta_0 + \beta_1 Payout_{i,t-1} + (\beta_2 + \delta Post_t) * ROA_{i,t-1} + \beta_3 AGE_{ii} + \beta_4 (AGE_{ii}^2 / 100) + \varepsilon_i + u_{ii}$$
(3)

 $(AGE^2/100)$:

The results in column (2) of Table 4 are consistent with the life-cycle hypothesis that older firms pay more dividends out of earnings. As predicted, the magnitude of the coefficient δ is reduced after firm age is included in the model. Moreover, the result shows an inverse-U-shaped relationship between dividend payout ratios and firm age. Dividend payout ratios initially increase with firm age, at a rate of about 0.5 percent per year. However, the negative coefficient on the age quadratic means that the positive relation between firm age and dividend payout ratio is reversed as firms age beyond a certain point. The estimates shown in column (2) of Table 4 indicate that firms older than 42 years¹⁶ will reduce their average payout ratios in the following years, holding profitability constant. This "aging effect" could reflect the higher agency costs associated with larger size of organization as firms grow older.¹⁷

¹⁶ The critical firm age at which dividend payout reaches its maximum is given by $AGE^* = -\beta_3 / (2\gamma/100) = -0.007888 / (2*0.00929 / 100) = 42.45.$

¹⁷ For example, DeAngelo, DeAngelo, and Skinner (1994) study a sample of firms that reduce dividends. They find that within the three years after the dividend reduction, 87 percent of sample firms engage in contractual renegotiations—with lenders, unions, government, and/or management.

In column (3) of Table 4, we see the results of a regression in which a dummy variable for mature firms is added to equation (3). The dummy variable for mature firms is equal to one when a firm is older than the median firm in its 3-digit industry. As predicted by the life-cycle hypothesis, the coefficient of the dummy variable for mature firms is positive. It is significant at the one-percent level. On average, the dividend payout ratio is 6.6 percentage points higher for mature firms (firms older than the industry median) than for young firms (firms younger than the industry median).

5.5. Reactions of High Dividend Payers and Low Dividend Payers

Columns (4) to (8) of Table 4 show the results of quintile-specific regressions. No significant change is found among firms in Quintile 4 in the post-JGTRRA period. The firms in Quintile 5 have a decrease in the dividend payout ratio (significant at the tenpercent level). By contrast, the firms in Quintiles 1, 2, and 3 have significant increases in payout ratios. The estimates of δ are positive and significant for Quintiles 1, 2, and 3, at the one-percent level.

The similarity of the results for the lower three quintiles is unsurprising given their similar composition of young and mature firms, as shown in Table 3. To gain further insights into the difference in payout behavior between young firms and mature firms, I divide the sample into two subgroups –young and mature firms –and apply model (2) to the two groups of firms separately. The results are presented in columns (9) and (10) of

Table 4.

The estimates of δ are significantly positive (at the one-percent level) for young firms (*i.e.*, firms younger than the industry median). This finding is consistent with the theoretical prediction that young firms will increase their dividend payout in response to the 2003 Tax Act. However, the estimates of δ are insignificant for mature firms (*i.e.*, firms older than the industry median). In other words, mature firms do not appear to have responded significantly to JGTRRA. This can be interpreted in light of the dividend smoothing theory that increased dividend levels would be difficult to maintain for high dividend payers. Overall, the regression results are consistent with the matched-pairs *t*tests.

The results in columns (9) and (10) also help differentiate the age effect from the alternative interpretation. One alternative interpretation of the age effect discussed in Section 5.4 could be a vintage effect that firms born before a certain date pay more. If the vintage effect were the driver of the increases in dividend payout, *AGE* would be statistically significant only for young firms (but not for mature firms) because the young firms have a higher correlation between age and vintage than the mature firms. In contrast, columns (9) and (10) show that *AGE* is a statistically significant predictor of dividend payout for mature firms, while insignificant for young firms. The results cast a great deal of doubt on the vintage effect as an alternative interpretation for the increases in dividend payout as firms grow older.

5.6. Multinomial Logit Regressions

According to Baker and Kennedy (2002), the 10-year survival rate of firms trading on the New York Stock Exchange and the American Stock Exchange is only 61 percent. In the previous literature (for example, Chetty and Saez (2006)), researchers have used balanced samples to estimate the effects of tax-code changes on corporate dividend policy. Until now, the analysis here has also used a balanced sample. However, the firms that survive are more likely to be financially stable and mature firms, and the fact that fewer public firms survive after 1997 (see Figure 2(a)) could lead to an overestimation of the effects of policy changes made during the period, including JGTRRA. Chetty and Saez also conclude that without a direct measure of the entry and exit effects, it is difficult to make precise inferences about the effects of the 2003 tax cut on the level and concentration of corporate distributions.

A firm's dividend policy is not observable if the firm in question has exited the market, either because of takeover, failure, or other reasons. If a firm that exited the market had been able to stay in the market, and if the best dividend policy had been to not pay dividends, then nonlinear least squares regressions would be inefficient, because the sample variance is conditioning on the observability of the firm's dividend policy. The conditional variance could be heteroskedastic, and any model for the conditional variance would be arbitrary (Wooldridge 2002). Moreover, a Tobit model would be inappropriate because firms could choose to exit the market due to liquidation, merger, takeover, privatization, etc., but not necessarily because of the potential that dividends could be

negative or zero. For example, if a firm exits because of a merger, it is entirely possible that, without the merger, the firm still would have paid dividends.

One way to solve this estimation bias problem is to add the choice of firm exit into the model of corporate dividend policy, and estimate the relative probabilities among alternatives. In the following maximum likelihood regressions, three different choices can be made by firms each year: exit, pay no dividends, or pay positive dividends. The probability of exiting the market is normalized, so that comparisons can be made across the choices. In year *t*, let j = 0 if the firm exits the market, j = 1 if the firm pays no dividends, and j = 2 if the firm pays dividends. The probability of the firm exiting the market is

$$P(y_i = 0 \mid x) = 1/[1 + \sum_{h=1}^{2} \exp(x_i^{\prime} \beta_h)].$$
(4)

The probability of the firm being a non-dividend payer or dividend payer is

$$P(y_i = j \mid x) = \exp(x_i \beta_j) / [1 + \sum_{h=1}^{2} \exp(x_i \beta_h)], \quad j=1, 2.$$
(5)

A log-likelihood estimator is used to estimate the parameters. The log-likelihood function to be maximized is

$$\ln L = \sum_{i=1}^{N} \sum_{h=0}^{2} d_{ij} \ln P(y_i = j), \qquad (6)$$

where $d_{ij} = 1$ if alternative *j* is chosen by firm *i*, and 0 if not. For each *i*, only one of the d_{ij} 's is equal to one.

The model implies that the log-odds ratios can be computed as

$$\ln\left(\frac{P(y_i=j)}{P(y_i=k)}\right) = x_i(\beta_j - \beta_k) = x_i\beta_j \quad \text{if } k = 0.$$
(7)

Therefore the estimated odds ratio, P_j / P_0 , implies the relative probability of alternative payout policies, relative to the choice of exiting the market. Odds ratios greater (less) than one correspond to positive (negative) parameter estimates. All standard errors have been adjusted for heterogeneity and firm clustering.

5.6.1. Probabilities of Firm Exit and Dividend Policy by Firm Age

To give an intuitive illustration of the different payout responses of young firms and mature firms to the 2003 Tax Act, Figures 5(a) and 5(b) show the probabilities of a firm exiting the market and paying dividends, before and after JGTRRA. The probabilities are estimated by the linear prediction with parameters from logit regressions of probabilities on firm age and its square. As the graphs show, as firms age, they are monotonically more likely to pay dividends and less likely to be non-dividend payers. This result, combined with the previous result that emerged from the earlier analysis of payout ratios, indicates that as the surviving firms grow older, they are more likely to pay dividends and also pay more dividends, until after a certain age where the trend between the dividend payout ratio and firm age reverses.

The probability of firm exit increases in the early stages of the firm life cycle, and declines in the later stages. The inverse-U-shaped curves in Figure 5(a) and 5(b) indicate

that younger firms have higher probabilities of exit, due to competition, financial distress, lack of managerial experience, or other factors. This pattern is particularly pronounced in high-tech industries. Older firms that have overcome these problems are less likely to exit.

In Figure 6(a), the probabilities of a firm paying dividends in the pre- and post-JGTRRA periods are compared by firm age. Consistent with the theoretical predictions, young firms are more likely to pay dividends after the 2003 Tax Act. On the other hand, older firms become less likely to pay dividends than before. This mean reversion is reflected as a flatter probability curve in the graph. Figure 6(b) shows a similar pattern in comparing the probabilities of non-dividend-paying around the 2003 Tax Act.

5.6.2. The Effects of Within-Firm Control Variables

Tables 5 and 6 present the estimates of odds ratios and the marginal effects from pooled multinomial logit regressions, with standard errors corrected for heterogeneity and firm clustering. The results show that the coefficients for firm age are statistically significant at the one-percent level among non-payers and payers in both periods. Before JGTRRA, as the average firm with a 12-year history grows older, it is 0.74 percent more likely to pay dividends in the next year, and 0.81 percent less likely to be a non-payer, holding other characteristics constant. After JGTRRA, the average firm with a 12-year history is 0.65 percent more like to pay dividends in the next year, and 0.73 percent less likely to be a non-payer.

Comparing the control variables in the pre- and post-JGTRRA periods, the average

firm is older in age (12 to 15 years), less profitable, and larger in size of market capitalization. It has fewer investment opportunities (Tobin's Q declined from 2.34 to 2.07), more free cash flows, lower leverage, and higher liquidity. The average rate of economic growth declined substantially, from 3.61 percent before JGTRRA to 1.63 percent after JGTRRA.

In Tables 5, 6, and 7, I use standardized ROA (abbreviated in the tables as S ROA). To get standardized ROA for a firm, I subtract the industry average ROA, and then divide by the industry standard deviation. This controls for the substantial degree of industry heterogeneity in ROA. As shown in Table 5, the coefficients for standardized ROA and size of market capitalization are both positive and significant. Their marginal effects (Table 6) indicate that firms with either higher profitability or a larger size of market capitalization are more likely to pay dividends and less likely to exit the market or to pay no dividends.

The marginal effect of profitability on the probability of paying dividends is higher in the post-JGTRRA period, while the marginal effects on the probabilities of exiting the market or not paying dividends are both reduced. The marginal effects of size of market capitalization are slightly different. Although the probability of paying dividends is still higher for larger firms, the marginal effect of larger size is slightly lower in the post-JGTRRA period. These changes in marginal effects imply that smaller and more profitable firms are the most responsive to changes in dividend policy, while larger and less profitable firms are less likely to pay dividends after JGTRRA. This is consistent with the

mean reversion found in the comparison of younger and older firms.

The coefficient of Tobin's Q is negative (positive) and significant in the case of dividend payers (non-payers), which suggests that firms with fewer investment opportunities are more likely to pay positive dividends. This is consistent with the implication of the firm life-cycle hypothesis, that dividend increases are often associated with a shrinking investment opportunity set. The average level of investment opportunities decreased after JGTRRA. However, the estimated relationship between investment opportunities and dividend payment still holds. The magnitudes of the marginal effects turn out to be larger than before JGTRRA.

The coefficient of free cash flow is significant only in the case of non-payers in the pre-JGTRRA period, and only in the case of dividend payers in the post-JGTRRA period. The marginal effects imply that free cash flow is negatively related to the probability of paying dividends. One interpretation of this result is that free cash flow is reduced by past dividend payments, and is thus negatively related to current dividend payments. For the same reason, liquidity—a broader measure of financial resources than free cash flow—is also negatively related to the probability of paying dividends.

As shown in Tables 5 and 6, the significant negative coefficient of leverage in the probabilities of both dividend policies indicates that firms with high indebtedness are more likely to exit the market. The marginal effect of indebtedness on the probability of firm exit is even larger in the post-JGTRRA period. Before JGTRRA, leverage is positively correlated with the propensity to pay dividends. However, after JGTRRA, firms with high

indebtedness are less likely to make corporate distributions.¹⁸ This conclusion holds even though firms have reduced the average level of leverage in the post-JGTRRA period.

The relation between the availability of financial resources and the propensity to pay dividends is consistent with the firm life-cycle hypothesis. For young firms facing abundant investment opportunities and a lack of available funds (*e.g.*, limited sources of external capital), the payout policy was simply cut to fit the available funds. It is also consistent with the notion of free cash flow being a measure of the ability of a company to generate internal growth, and young firms are expected to have higher internal growth than mature firms, and make more corporate distributions in the future. The differences between mature and young firms are less significant in the post-JGTRRA period. This is consistent with the mean reversion between young firms and mature firms as the young firms mature. As the marginal costs of equity decreased after JGTRRA, the difference in their payout responses between young firms and mature firms has been effectively narrowed.

5.6.3. The Effects of Other Control Variables

The measure of industry age is significant in most cases, but not in the regression for the probability of not paying dividends in the post-JGTRRA period. Before JGTRRA,

¹⁸ This is consistent with the finding in Bagwell and Shoven (1989) that firms with high indebtedness are less likely to make corporate distributions.

firms in older industries were more likely to pay dividends and firms in younger industries were less likely to pay dividends. (See Table 6.) After JGTRRA, firms in older industries are still significantly more likely to pay dividends (at the five-percent level). However, the difference between firms in younger and older industries has narrowed as the average firms in most industries have grown older. The marginal effect of an additional year of industry age on the probability of paying dividends is reduced from 0.8 percent to 0.6 percent, and its effect on the probability of not paying dividends is changed from -0.9 percent to -0.5 percent.

Firm maturity has a significant effect in most of the regressions. This result indicates that in the pre-JGTRRA period, holding firm age constant, firms that are relatively mature in their industry are more likely to pay dividends than firms that are relatively young in their industry. Depending on the magnitude of the difference in industry age, if we hold constant the age of the firm, a mature firm in a one-year younger industry could be more likely to pay dividends than a young firm in a one-year older industry. An average 12-year-old mature firm in a young industry is 1.0 percent more likely to pay dividends than a young firm at the same age in an old industry.

However, as we have seen, the coefficients suggest that there is mean reversion between the payout propensities of mature and young firms in the post-JGTRRA period. For example, an average 15-year-old young firm in an old industry is 3.2 percent more likely to pay dividends than a mature firm at the same age in a young industry, holding other characteristics constant. This result is significant at the ten-percent level. Thus,

holding constant firm age and other firm characteristics, young firms in older industries were more likely to pay dividends than mature firms in younger industries in the post-JGTRRA period.

The rate of economic growth has a positive effect on the probability of paying dividends, and it is significant at the one-percent level in all cases. Unsurprisingly, the lower rate of economic growth in the post-JGTRRA period is associated with a lower average level of investment opportunities (implied by Tobin's Q). Furthermore, the significant relationship between economic growth and the propensity to pay dividends indicates that firms are more likely to pay dividends in a good economy, all else equal. This is consistent with the prediction in Chapter Three that in a good economy, an increase in dividend payments is more likely to be interpreted as an increase in cash flow (good news) rather than a decrease in investment opportunities (bad news).

Combining these findings with the above analyses of firm characteristics, we can summarize the characteristics that are most likely to be associated with paying dividends in the post-JGTRRA period. Dividend payments are more likely for young firms in older industries with a longer firm history and a longer industry history, with higher profitability, lower investment opportunities, larger size of market capitalization, lower free cash flow (or higher payments in history), and lower leverage.

CHAPTER SIX

SENSITIVITY ANALYSIS AND ADDITIONAL TESTS

If the assumption of irrelevance of independent alternatives (IIA) is violated, multinomial logit regression is inappropriate. Therefore, the assumption of irrelevance of independent alternatives is tested using Hausman-McFadden and Small-Hsiao tests. The Hausman-McFadden test statistics are negative. As suggested by Long and Freese (2006), a negative Hausman-McFadden statistic often provides evidence that the assumption of independence of irrelevant alternatives has not been violated. The Small-Hsiao test suggests that omitting the category of payers does not violate the IIA assumption, while omitting the category of non-payers violates the IIA assumption. Wald tests for combining alternatives are implemented, and the results reject the assumption that any pair of alternatives can be combined. These results suggest that it is appropriate to use multinomial logit techniques in this context.

I also looked into the importance of firm age in high-competition and lowcompetition industries, where firms have differing exit rates. Following Giroud and Mueller (2010), the degree of competition in the firm's industry (3-digit SIC) is measured with a Herfindahl index, $H_E: H_E = \sum_{i=1}^N s_i^2$, where *N* is the number of firms in the same 3digit industry, the subscript *i* identifies the firm, and s_i is the firms' market shares, expressed in percentage points. A higher Herfindahl index indicates lower competitiveness in the industry.

Table 7 replicates the analysis of Table 5 by comparing firms in high-competition and low-competition industries (*i.e.*, industries with a Herfindahl index below or above the median for all industries). Fewer firm characteristics are significantly correlated with dividend policy in the low-competition industries. One interpretation of this result is that, for an average non-dividend payer in a low-competition industry, the choice between exiting the market and staying in the market without paying any dividends is less sensitive to the changes in observed firm characteristics.

In the post-JGTRRA period, the negative relationship between firm age and the probability of not paying dividends in low-competition industries is reduced in magnitude. The positive relationship between firm age and the probability of paying dividends in low-competition industries is also smaller in magnitude. This implies a mean-reversion pattern in low-competition industries, as observed in Figure 6(a) and 6(b). Since low-competition industries are likely to be older industries,¹⁹ this result is consistent with the finding in the last section that young firms in older industries are more responsive to the tax-law change.

Firms in high-competition industries show a different pattern. Firm age has a smaller positive effect on the probability of paying dividends for firms in high-competition industries. Firm age also has a larger negative effect on the probability of not paying dividends. This is probably because the probability of firm exit is larger in industries with

¹⁹ In high-competition industries, the average industry age is 9.7. In low-competition industries, the average industry age is 12.7.

higher competition.

To test the sensitivity of the results with respect to the way in which firm age is measured, multinomial logit regressions similar to the regressions in Table 5 are also implemented using the listing age (the number of years since the IPO date). The marginal effects, which are available on request, are qualitatively consistent with the effects reported above.

CHAPTER SEVEN

CONCLUSION

In this study, I investigate whether corporate dividend payout policies responded to Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA), and how the responses varied according to the life-cycle stage of the firm, as well as other firm and industry characteristics. In particular, I tested (1) whether the decrease in dividend tax rates was associated with changes in dividend payout, and (2) whether the corporate dividend policy responses differed among firms of different ages and in different industries. Dividend payout ratios and the propensity to pay dividends are tested separately.

The test of the payout responses to the dividend tax cut has a lot of complications. I have included a number of variables that may be relevant to control for the payout responses of firms, but there is still a great deal of variation not controlled for in the models. For example, the dividend payout shows strong stickiness, especially for the established mature firms, due to managers' concerns regarding market reaction. Also, with a growing proportion of tax-exempted institutional shareholders and tax-deferred individual shareholders, firms become less sensitive to dividend taxes. Moreover, the marginal cost of funds can vary a lot depending on the composition of the marginal sources of funds. In a low-interest-rate environment and where leverage is high, the cost of funds is less correlated with the dividend taxes. Another factor that would affect corporate payout behavior is the expectation of future tax rates. If dividend tax rates are expected to

increase after a certain time period, firms may choose to accelerate the payout and move payments from the high-tax period to the low-tax period. Without controlling for all the firm attributes, it is difficult to have a measure of the direct impact of dividend tax policy on corporate payout.

Nevertheless, the findings of this study are supportive of the predictions. First, as predicted by signaling theory, a lower dividend tax rate is associated with higher dividend payments. Also, the reduction in the dividend tax rate meant that surviving firms became more likely to pay dividends. Since the overall survival rate declined after 2003, the impact of the 2003 tax cut on the likelihood of dividends-paying would be overestimated without any estimation of the exit of firms. To reduce the selection bias, I include firm exit as an alternative choice for the firm and use the multinomial logit model to estimate the likelihood of dividend paying.

These findings are consistent with the signaling theory. But the signaling theory does not differentiate among firms in the cost of funds. I find the new view and traditional view of dividend taxation theories are useful in understanding the variation across firms. As firms have different sources of funds and different composition of the sources, their marginal costs of funds may have different correlations with the dividend tax rate, and thus may lead to different reactions to the 2003 tax cut. A firm with a higher proportion of retained earnings is more likely to behave according to the prediction of the new view, while a firm with a higher proportion of new issues of equity is more likely to behave according to the prediction of the traditional view.

Among mature firms, whose marginal source of funds is more likely to be from retained earnings than young firms, and for which the cost of funds is not as much affected by the dividend tax, the propensity to pay dividends does not appear to be impacted by the 2003 tax cut. This is consistent with the new view of dividend taxation. In the data, firms in the highest payout ratio group (Quintile 5) experienced a significant decline in their payout ratios, while firms in Quintile 4 experienced positive but insignificant changes in payout ratios. This phenomenon is consistent with the predictions of the firm life-cycle hypothesis that firms tend to pay more dividends as they grow to a mature stage, but lower dividends as the firms grow to a stage where profitability declines and/or they face more agency problems. A separate test was performed for mature firms (*i.e.*, firms that are above the median firm age in their 3-digit industry). This test showed no significant changes in payout ratios after 2003, but it did find a significant inverse-U-shaped relation between firm age and payout ratios.

In contrast to the responses of mature firms, increases in dividend payout are observed in young firms, whose marginal source of funds is more likely to be from new issues of equity. The marginal source of funds of young firms is close to the assumption of the traditional view of dividend taxation, and their payout response to the 2003 tax cut is consistent with the traditional view. Moreover, as predicted by the firm life-cycle hypothesis, young firms increase their dividend payout when they grow older, as well as in response to reductions in earnings growth and in the level of investment opportunities. In the post-JGTRRA period, profitability and investment opportunities were lower, and

average firms were older, and young firms made higher dividend payments. For example, following JGTRRA, low- and moderate-payout firms (Quintiles 1, 2, 3) exhibited larger increases in dividend payout ratios.

The findings show that firms responded to the realignment of dividend tax rates and capital-gains tax rates by adjusting their corporate dividend policies. This conclusion is consistent with the findings in previous papers, which also found that JGTRRA led to increases in dividends. This relationship still holds after taking the choice of firm exit into consideration. However, this paper differs from previous papers by differentiating the responses of firms of different ages. The results show that the increase in aggregate dividend payout is largely driven by the behavior of young and growing firms, rather than by the tax-arbitrage behavior of older and mature firms.

Since the corporate payout increased with the reduction in the dividend tax rate, the total dividend tax revenue would not have decreased as much as the reduction in the dividend tax rate. However, the number of firms reduced rapidly after the 2003 tax cut, and this also had a negative effect on the total dividend tax revenues. Therefore, the tax policy implications of the 2003 tax cut cannot be traced out simply by looking at the effects on total dividend tax revenues.

APPENDICES

APPENDIX 1

Tables

Variables	Definitions
Firm Age	Firm age is computed as the difference between year <i>t</i> and the first year in which the firm appeared on the CRSP/COMPUSTAT Merged Database, plus one. An alternative measure, the listing age, is the number of years between the current year and the date of the firm's initial public offering, plus one.
ROA	Return on Assets (ROA) is computed as the ratio of the firm's operating income before depreciation (DATA13) dividend by the book value of assets (DATA6).
Free Cash Flow	The measure of free cash flow is calculated as the firm's free cash flow weighted by its market value of assets. The amount of free cash flow is calculated by adding net income with depreciation and deferred taxes and then subtracting dividends paid and capital expenditures. Following Lehn and Poulsen (1989), the firm's amount of free cash flow is computed as DATA13 - DATA15 - (DATA16 - DATA35) - DATA19 - DATA21.
Tobin's Q	Tobin's Q (or market-to-book value) is calculated as the market value of the firm's assets divided by their book value (DATA6).
Market Value of Assets	The market value of assets is calculated as book value of assets (DATA6) minus book value of common equity (DATA60) plus market value of common equity (DATA25xDATA199).
Size	Size is calculated as the natural logarithm of the firm's market capitalization (DATA25 x DATA199) to the equal-weighted average of all firms' market capitalization in year <i>t</i> .
Leverage	Leverage is the ratio of total liabilities (DATA181) to market value of assets (as defined above).
Liquidity	Liquidity is calculated as the firm's cash and short-term investment (DATA1) divided by the market value of assets.
Industry Age	Industry age is the median listing age of all firms in the same 3-digit SIC industry in year <i>t</i> .
Maturity	Binary variable equal to 1 if the firm age is greater than or equal to industry age.
GDP Growth	The relative change in the U.S. gross domestic product. The data are from the U.S. Bureau of Economic Analysis.

Table 1. Variable Definitions

	Pre	-JGTRR	RA			Post-	JGTRRA		Overall			
	Mean	SD	Median	95%	Mean	SD	Median	95%	Mean	SD	Median	95%
Firm Age	11.77	10.09	8.07	33.91	15.88	11.81	12.31	41.92	13.55	11.06	10.08	37.13
Return on Assets	0.05	0.26	0.11	0.28	0.04	0.27	0.10	0.27	0.05	0.27	0.10	0.28
Tobin's Q	2.34	3.45	1.50	6.29	2.05	1.94	1.53	4.96	2.21	2.89	1.51	5.69
Free Cash Flow	0.91	111.20	0.08	0.52	5.08	726.34	0.08	0.48	2.72	485.36	0.08	0.51
Size	-2.54	2.19	-2.66	1.33	-2.38	2.18	-2.43	1.40	-2.47	2.19	-2.55	1.37
Leverage	32.95	23.93	28.63	78.39	31.67	22.35	27.49	75.72	32.39	23.27	28.12	77.48
Liquidity	10.42	16.28	4.98	37.86	13.85	18.82	8.04	46.12	11.91	17.51	6.23	41.50
Industry Age	9.39	5.20	7.98	21.16	13.60	6.12	12.11	26.00	11.22	5.99	10.02	23.54
Maturity	0.51	0.50	1.00	1.00	0.52	0.50	1.00	1.00	0.52	0.50	1.00	1.00
GDP Growth	3.61	1.11	4.10	4.80	1.75	1.99	2.50	3.50	2.80	1.81	3.00	4.80
No. of Observations	39,271				27,518				66,789			

 Table 2. Descriptive Statistics

		Me	ans		Differences							
	No. of Obs	Pre- JGTRRA	Post- JGTRRA	% Positive	% Negative	Mean Difference	Std. Dev.	<i>t</i> -statistic	H ₀	Mature Firms	Mature Firms	
Overall	16,362	0.089	0.118	36	21	0.029	0.154	24.16***	Diff>0	9,408	57	
Quintile												
1	3,272	0.000	0.038	22	0	0.038	0.109	19.94***	Diff>0	1,397	43	
2	3,272	0.000	0.033	20	0	0.033	0.101	18.69***	Diff>0	1,419	43	
3	3,273	0.006	0.050	30	14	0.043	0.127	19.37***	Diff>0	1,613	49	
4	3,272	0.115	0.164	62	38	0.048	0.155	17.71***	Diff>0	2,378	73	
5	3,273	0.324	0.307	48	51	-0.017	0.230	4.22***	Diff<0	2,601	79	
Life-Cycle	e Stage											
Young	6,954	0.047	0.084	29	12	0.037	0.137	22.75***	Diff>0			
Mature	9,408	0.121	0.144	42	37	0.023	0.165	13.48***	Diff>0			

 Table 3. Matched-Pairs t-Tests on Dividend Payout Ratios of Restricted Sample

Note: *** denotes significance at the 1% level.

** denotes significance at the 5% level.

* denotes significance at the 10% level.

Table 4. The Effects of JGTRRA and Firm Age on Dividend Payout Ratios of Restricted Sample

The table estimates fixed effects OLS regressions with standard errors corrected for heterogeneity and firm clustering. The dependent variable is current dividend payout ratios Payout_t. *t*-statistics are in parentheses. The symbols ***, **, and * indicated statistical significance levels of 1%, 5%, and 10%, respectively. The sample period is 1993-2010.

							Quintil	le 1	Quintile	e 2	Quintil	e 3	Quintile 4	Quinti	le 5	Youn Firms	g S	Matu Firm	re Is
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	(8)		(9)		(10))
Payout _{t-1}	0.112	***	0.110	***	0.110	***	0.115		0.084		0.018		0.049	0.132	***	0.084	*	0.119	***
	(4.78)		(4.70)		(4.70)		(1.61)		(1.03)		(0.29)		(1.32)	(4.66)		(1.91)		(4.45)	
ROA _{t-1}	-0.091	***	-0.041	***	-0.041	**	-0.024	***	-0.043		-0.107	**	-0.073	-0.069		-0.049	***	-0.021	
	(4.07)		(2.09)		(2.09)		(2.35)		(1.64)		(2.43)		(0.97)	(0.34)		(3.38)		(0.47)	
Post*	0.136	***	0.061	***	0.061	***	0.121	***	0.083	***	0.125	***	0.085	-0.345	*	0.074	***	0.034	
ROA _{t-1}	(5.19)		(2.73)		(2.73)		(4.63)		(2.94)		(2.85)		(1.48)	(1.80)		(4.01)		(0.63)	
Age			0.005	***	0.005	***	0.000		0.003	***	0.002		0.005	0.018	*	0.001		0.008	***
			(4.77)		(4.76)		(0.33)		(2.66)		(1.17)		(1.61)	(1.97)		(0.77)		(3.49)	
Age ² /100			-0.005	***	-0.005	**	0.006		0.001		0.004		-0.002	-0.020	*	0.006		-0.009	***
			(2.34)		(2.33)		(1.46)		(0.52)		(0.95)		(0.57)	(1.74)		(1.15)		(2.61)	
Mature					0.066 (13.24	***													
)														
Constant	0.095	***	0.017		-0.025	**	-0.020	*	-0.027	**	-0.025		-0.015	-0.079		0.023	**	-0.023	
	(28.19)		(1.38)		(2.28)		(1.82)		(2.50)		(1.62)		(0.23)	(0.52)		(2.14)		(0.64)	
R-squared No. of Obs.	0.117 15,406	7 5	0.137 15,406		0.101 15,406		0.066 3,114		0.021 3,066		0.011 3,076		0.011 3,090	0.007 3,060		0.101 6,545		0.125 8,861	

Table 5. Multinomial Logit Regression

This table presents estimates of pooled multinomial logit regressions with the base outcome of firm exit using the unrestricted sample. All standard errors have been adjusted for heterogeneity and firm clustering. The symbols ***, **, and * indicated statistical significance levels of 1%, 5%, and 10%, respectively. The sample period is 1993-2010.

	P	re-JGTR	RA		Post-JGTRRA					
	Coefficient	Odds Ratios	z-stati	istic	Coefficient	Odds Ratios	z-stat	tistic		
Case 1: Non-Divide	nd Payer									
Within Firm										
Firm Age	-0.021	0.979	5.24	***	-0.020	0.980	4.88	***		
S ROA	0.111	1.117	4.60	***	0.115	1.122	4.39	***		
Tobin's Q	0.019	1.019	1.94	*	0.068	1.070	2.94	***		
Free Cash Flow	-0.004	0.997	2.69	***	-0.004	0.996	1.34			
Size	0.033	1.034	2.16	**	0.058	1.060	3.43	***		
Leverage	-0.014	0.986	13.51	***	-0.014	0.986	10.44	***		
Liquidity	-0.001	0.999	0.50		-0.004	0.996	3.81	***		
Cross Firm										
Industry Age	-0.026	0.974	4.38	***	0.010	1.010	1.50			
Maturity	-0.485	0.616	7.40	***	0.039	1.039	0.51			
Macro										
GDP Growth	-0.151	0.859	6.79	***	-0.080	0.923	5.22	***		
Constant	4.306		35.85	***	3.215		23.12	***		
Case 2: Dividend Paver										
Within Firm	iyei									
Firm Δge	0.045	1 046	8 71	***	0.035	1.036	6 79	***		
S ROA	0.659	1.040	13 72	***	0.035	1.050	12 37	***		
Tobin's O	-0.370	0.691	4 75	***	-0.278	0.757	5 44	***		
Free Cash Flow	-0.046	0.071	1 64		-0.278	0.757	2 52	**		
Size	0.631	1 880	25 56	***	0 542	1 710	2.52	***		
Leverage	-0.010	0.990	3.63	***	-0.013	0.987	5.89	***		
Liquidity	-0.006	0.994	1.64		-0.025	0.975	7.04	***		
~ ~										
Cross Firm			< 							
Industry Age	0.049	1.051	6.73	***	0.050	1.052	6.20	***		
Maturity	-0.358	0.699	3.65	***	-0.194	0.823	1.81	*		
Macro										
GDP Growth	-0.105	0.900	4.50	***	-0.035	0.965	2.13	**		
Constant	3.238		11.11	***	3.215		23.12	***		
Observations	20 271				27 510					
	39,271				27,310					
Log Likelihood	-21,680.32				-17,280.19					
Pseudo R-squared	0.280				0.223					

		Pre-JG	TRRA			Post-	JGTRRA	
	Mean	SD	-+SD/2	Marginal Effects	Mean	SD	-+SD/2	Marginal Effects
Within Firm								
Age	11.575	9.947	-0.081	-0.008	15.288	11.509	-0.094	-0.008
S ROA	-0.009	0.981	-0.051	-0.052	-0.005	0.976	-0.053	-0.054
Tobin's Q	2.339	3.453	0.148	0.042	2.070	1.996	0.096	0.048
Free Cash Flow	0.914	111.4	0.544	0.004	5.630	765.18	0.709	0.006
Size	-2.616	2.162	-0.136	-0.062	-2.450	2.168	-0.128	-0.059
Leverage	32.795	32.95	-0.027	-0.001	31.444	22.50	-0.018	-0.001
Liquidity	10.545	16.44	0.008	0.001	13.944	19.26	0.046	0.002
Cross Firm								
Industry Age	9.364	5.144	-0.048	-0.009	13.137	5.744	-0.027	-0.005
Maturity (0->1)	0.505	0.500		-0.039	0.509	0.500		0.032
Macro								
GDP growth	3.608	1.104	-0.014	-0.013	1.633	2.032	-0.020	-0.010

Table 6. Marginal Effects of Multinomial Logit Regression

Panel A: Marginal Effects of Independent Variables on Firms' Probability of Not Paying Dividends

Tunor D. Murginar Effects of Independent Variables on Trinis Trobublity of Taying Dividends	Panel B: Marginal Effects of Independent V	ariables on Firms'	Probability o	of Paying Dividends
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		Pre-JG	TRRA		Post-JGTRRA						
	Mean	SD	-+SD/2	Marginal Effects	Mean	SD	-+SD/2	Marginal Effects			
Within Firm											
Age	11.575	9.947	0.074	0.007	15.288	11.509	0.087	0.008			
S ROA	-0.009	0.981	0.063	0.064	-0.005	0.976	0.065	0.067			
Tobin's Q	2.339	3.453	-0.156	-0.044	2.070	1.996	-0.095	-0.047			
Free Cash Flow	0.914	111.4	-0.609	-0.005	5.630	765.18	-1.000	-0.007			
Size	-2.616	2.162	0.152	0.069	-2.450	2.168	0.149	0.068			
Leverage	32.795	32.95	0.008	0.000	31.444	22.50	-0.002	-0.000			
Liquidity	10.545	16.44	-0.010	-0.001	13.944	19.26	-0.056	-0.003			
Cross Firm											
Industry Age	9.364	5.144	0.043	0.008	13.137	5.744	0.033	0.006			
Maturity (0->1)	0.505	0.500		0.010	0.509	0.500		-0.032			
Macro											
GDP growth	3.608	1.104	0.004	0.004	1.633	2.032	0.011	0.005			

Note: Following the multinomial logit regression results in Table 5, the marginal effect were calculated as the change in probability associated with a marginal change in one explanatory variable at the mean values of the other variables.

Table 7. Sensitivity TestHigh-Competition vs. Low-Competition Industries

The table estimates pooled multinomial logit regressions with the base outcome of firm exit using the unrestricted sample. An industry with a Herfindahl index lower than the median Herfindahl in any given year is categorized as High-competition industry. All standard errors have been adjusted for heterogeneity and firm clustering. The symbols ***, **, and * indicated statistical significance levels of 1%, 5%, and 10%, respectively. The sample period is 1993-2010.

		Pre-J	GTRRA		Post-JGTRRA					
	Low-Compet	ition	High-Compet	tition	Low-Comp	oetition	High-Competitio			
Case 1: Non-Divid	lend Payer									
Within Firm										
Firm Age	-0.025	***	-0.016	**	-0.021	***	-0.021	***		
S ROA	0.110	***	0.115	***	0.119	***	0.120	***		
Tobin's Q	-0.000		0.035	**	0.083	**	0.073	**		
Free Cash Flow	-0.006		-0.003	***	-0.007		-0.000	***		
Size	0.026		0.040	*	0.054	**	0.057	**		
Leverage	-0.014	***	-0.014	***	-0.015	***	-0.013	***		
Liquidity	-0.002		0.001		-0.004	*	-0.004	***		
Cross Firm										
Industry Age	-0.029	***	-0.013		0.002		0.025	**		
Maturity	-0.508	***	-0.466	***	0.066		0.025			
Macro										
GDP Growth	-0.137	***	-0.167	***	-0.084	***	-0.075	***		
Constant	4.374	***	4.135	***	3.367	***	2.980	***		
Case 2: Dividend	Payer									
Within Firm	2									
Firm Age	0.040	***	0.052	***	0.036	***	0.032	***		
S ROA	0.549	***	0.905	***	0.530	***	0.708	***		
Tobin's Q	-0.430	***	-0.293	**	-0.242	***	-0.213	***		
Free Cash Flow	-0.053		-0.060		0.032		-0.062	**		
Size	0.638	***	0.628	***	0.564	***	0.522	***		
Leverage	-0.015	***	-0.005		-0.020	***	-0.003			
Liquidity	-0.004		-0.003		-0.014	***	-0.027	***		
Cross Firm										
Industry Age	0.027	***	0.101	***	0.031	***	0.048	***		
Maturity	-0.245	*	-0.474	***	-0.052		-0.335	**		
Macro										
GDP Growth	0.105	***	-0.116	***	-0.049	**	-0.035			
Constant	3.999	***	2.136	***	3.445	***	2.201	***		

APPENDIX 2

Figures



Figure 1(a). The Separating Equilibrium with Dividend Signaling

Dividend Payout


Figure 1(b). The Simplified Separating Equilibrium





Dividend Payout









Figure 2(b). Percentage of Firms Initiating Dividends, 1978-2010





Figure 2(c). Median Firm Age, 1978-2010



Figure 3. Count of Firms by Number of Years Paying Dividends, 1993-2010







Figure 4(b). Average Dividend Payout Ratios for Quintiles of Firms, 1993-2010





Figure 4(c). Average Dividend Payout Ratios for Young and Mature Firms



Figure 4(d). Average Yield Ratios for Young and Mature Firms

Figure 5. Predicted and Observed Probabilities of Firm Exit and Dividend Payout Policy by Firm Age





Figure 6. Mean Reversion in Probabilities of Firm Dividend Payout Policy by Firm Age



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